SRAGO

79-24 Srago says this is the entrance site evaluation (not Lone)

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

32.87293 -116.43506 R-5

REPLY TO: 3430 FI&DM Evaluation August 13, 1979

SUBJECT: Biological Evaluation of the Proposed Laguna Mountain Entrance Site

TO: Forest Supervisor, Cleveland N.F. 20 acres

Enclosed is the biological evaluation of the proposed Laguna Mountain Entrance Site.

In the report are options that include controlling dwarf mistletoe. If these options are selected, but other funds are not available to conduct these dwarf mistletoe control projects, FIDM funds are available and may be applied for.

If there are any questions concerning this report, please contact Mike Srago of my staff at (415) 556-6940.

Wilfred L. Freeman Jr.

WILFRED L. FREEMAN, JR., Director
Forest Insect and Disease Management

Enclosure

BIOLOGICAL EVALUATION OF THE LAGUNA MOUNTAIN ENTRANCE SITE

INTRODUCTION

Laguna Mountain Recreation Area is a part of the Descanso Ranger District, Cleveland National Forest. It is a wooded plateau at 5200-6400 ft. elevation, east of San Diego, California. As the forested area most accessible to the inhabitants of San Diego and surrounding communities, it receives as many as 1.5 million visitor-days of use per year. Six campgrounds, two picnic areas, 169 summer homes and two organization camps located on land administered by the Forest Service provide for the public's needs.

VEGETATION

Laguna Mountain contains about 7100 acres of timber in the yellow pine type, dominated by Jeffrey pine (Pinus jeffreyi), Coulter pine (P. coulteri) and California black oak (Quercus kellogii), with a minor component of canyon live oak (Q. chrysolepis) and incense-cedar (Calocedrus decurrens). Coast live oak (Q. agrifolia) can be found around the fringes of the plateau, and Perry Pinyon pine (P. quadrifolia) occurs on the eastern, abrupt edge of the plateau.

INSECTS AND DISEASES

Forest pests of Laguna Mountain have received considerable attention. Prior to about 1975, direct insect suppression measures aimed at reducing tree mortality caused by western pine beetle (Dendroctonus brevicomis) and California flatheaded borer (Melanophila californica) had been carried out for about fifty years. Surveys to locate western dwarf mistletoe (Arceuthobium campylopodum) show that this parasite is present over much of the forested area of the mountain, and is extremely heavy in localized areas. Annosus root rot caused by Fomes annosus has been noted since the early 1940's. In spite of past suppression efforts, tree mortality continues to occur at high levels on Laguna Mountain; and increases in recreation use are often accompanied by further deterioration of sensitive stands.

The overall mortality rate on Laguna Mountain is much higher than that occurring in other parts of California, exclusive of drought years. A survey conducted on the San Bernardino National Forest in 1976-1978 indicated mortality rates far lower than those found on Laguna Mountain.

In 1979, the Forest Service decided to invest $8-9 million over the next 22 years to develop additional recreation facilities. Because of the significant insect and disease problems on Laguna Mountain, a biological evaluation is being conducted on each recreation site where development is proposed, to determine what impact insects and diseases will have on the site, how to manipulate the site to enhance the recreation experience without creating greater insect

and disease problems and how to best maintain adequate forest cover on the site over a long period of time where insects and disease are now present.

TECHNICAL INFORMATION

The Laguna Mountain entrance site is a meadow bordered on three sides by a Jeffrey pine stand with a scattered understory of Jeffrey pine, incense-cedar and large and small California black oaks. The insects and disease found on the site are California flatheaded borer, annosus root rot, Armillaria root rot, western dwarf mistletoe, and Elytroderma needle cast.

California flatheaded borer (Melanophila californica):
The hosts of the California flatheaded borer are Jeffrey and Coulter pine. It is most severe in stands located on sites where environmental stress is common. Decadent or unhealthy trees are most frequently attacked and occasionally the tops of thrifty, vigorous trees are attacked.

Newly hatched larvae penetrate directly through the bark to the phloem. Here the larvae may feed from a few months to 4 years without any apparent effect on the host tree. Should host vigor and larval abundance not allow them to succeed, the larvae cut very short galleries before they are killed. Their galleries do not seriously injure the tree and are overgrown by the cambium. Should conditions be, or become, favorable for the larvae and unfavorable for the tree, the larvae develop rapidly and destroy the cambium. Although this insect can kill trees weakened by dwarf mistletoe and root disease, its primary importance is rendering trees increasingly susceptible to bark beetles.

Annosus Root Disease (Fomes annosus):
F. annosus is a higher fungus which kills and decays the roots of many coniferous forest trees. All western conifers are susceptible to attack by this fungus.

This fungus colonizes newly cut pine stumps and their roots and from there moves via root contacts into the root systems of adjacent live trees. It moves through the roots of these live trees to the root crown where it girdles and kills the host tree. Enlarging centers of F. annosus-killed trees are formed as this fungus travels from tree to tree through their root systems. The fungus may remain viable in the old stumps and roots of infected trees for over 50 years in east side pine and all newly established pines whose roots contact these old stumps may be killed. Thus, these areas may be nonproductive for over 50 years and the losses associated with F. annosus includes not only the original mortality but also the volume growth which would have resulted if the area encompassed by the center had been productive.

Armillaria Root Disease (Armillaria mellea):
A. mellea is a higher fungus that is found in most forest areas, on both conifers and hardwoods. The fungus attacks the roots and root crown of trees of all ages, killing the cambium and inner bark and causing a decay of both sapwood and heartwood.

It commonly spreads to living trees by rhizomorphs or root contact. Rhizomorphs are specialized cord-like fungus structures that grow out from an established infection to colonize new sites. When these rhizomorphs contact the root or root crown of a new host, they penetrate through the bark and attempt to establish a new infection. In the California forests, A. mellea is not an aggressive pathogen except in young conifer plantations. The fungus generally lives as a decay organism in the roots, lower bole and stumps of either dead or living trees. Where A. mellea is found causing mortality in older trees it is usually in association with large dead oaks or stumps of oaks that it can utilize as a food base.

Western Dwarf Mistletoe (Archeuthobium campylopodum):
Western dwarf mistletoe infectes Jeffrey, ponderosa and Coulter pines. Other conifers are rarely infected and hardwoods are immune. The pathogen is an obligate parasite that can only exist on a live host. It obtains all its nutrients, minerals and water from the host tree.

This parasite is a dioecious, perennial higher plant that produces seeds which are its means of spread. In the fall of the year when the fruit falls from the stem, the seed is ejected upward and outward. The seed (covered with viscin, a sticky, gelatinous substance), adheres to what ever it contacts. When the seed lands in the crown of a tree, it will adhere to the needles or limb, where it will overwinter. The following spring it will germinate and penetrate into the limb. For the next 2 to 4 years it will grow within the tree developing a root-like endophytic system in the inner bark and outer sapwood. It will then produce aerial shoots and in another 2-4 years it will produce viable fruit.

Spread of dwarf mistletoe is limited to the distance traveled by the seed, which from overstory to understory is usually 20-60 feet, but which may be as much as 100 feet if wind assists the seeds. A rule of thumb is that dwarf mistletoe can spread a distance equal to the height of the plants in the infected trees. Because of the various limits to spread, the actual spread rate through a stand is 1-2 feet per year.

Elytroderma Needle Cast (Elytroderma deformans):
Elytroderma needle cast is mainly a disease of Jeffrey and ponderosa pine in California. It has also been found on knobcone, lodgepole and pinyon pines.

The fungus causes the premature death of 1 year old needles, and a brooming and deformation of infected twigs and branches.

The disease is spread by fungal spores which are released in late summer and early fall from fruiting bodies borne on the infected

needles. Under suitable conditions, the spores germinate and infect the current years needles of susceptible hosts. The fungus then spreads from the needles into the twigs. The following spring the infected needles die and fruiting bodies begin to develop. The infection within the twigs spreads into the growing tips and buds, where it causes a brooming and deformation of future growth.

The effect of the disease depends on the proportion of the host crown which is infected. There is little effect upon the host until more than two-fifths of the twigs are blighted. The disease is most severe on seedlings, saplings and poles with poor crowns. Although direct killing of mature trees by this disease is infrequent, moderate to severe infection predisposes the host to other diseases and to bark beetle attack.

MANAGEMENT STRATEGIES

California flatheaded borer:
California flatheaded borer is most commonly a problem where trees are under stress, unhealthy or decadent. The key to reducing the impact of this insect is to maintain a healthy vigorous stand by: 1) regulating vegetative competition through stand manipulation to achieve optimum stand density and controlling shrubs and grasses, and 2) reducing the impact of dwarf mistletoe and regenerating Fomes annosus infection centers with trees that are resistant to the disease.

Also in areas where there is going to be new construction, special efforts should be made to prevent damage to the selected leave trees, especially in the root system.

Annosus Root Decay: Annosus root rot is seldom controlled in the usual sense of the word; instead, new infection centers are prevented through the use of a chemical, and stands are manipulated to minimize the effects of the fungus when present. These and other measures designed to prevent hazards and reduce the impact of this disease are:

Prevention of stump infection.

Granular borax, sodium tetraborate decahydrate, is registered for application to freshly cut stumps. It is effective in preventing most new infections, and its application is required on all stumps cut in and near developed recreation sites (FSM R-5 Supp. 2305.33). All of Laguna Mountain has been determined to be in or near developed recreation areas.

Type conversion. Conifers planted in and around infection centers will eventually become infected and die, leaving the center unstocked. All conifers are susceptible to one degree or another, but hardwoods are rarely infected. Accordingly, hardwoods should be favored, planted, or otherwise regenerated in and around infection centers.

If hardwoods are planted around infection centers they may interrupt the continuous root contacts between conifers and slow down or stop the spread of the disease. The fungus will eventually die out in the centers so that conifers can be regenerated, but this will probably take 50 years or more.

Location of facilities. Buildings, campgrounds, picnic areas, and other facilities should not be located near infection centers. Unfortunately, most potential sites on the Mountain are located near a center.

As an alternative, before locating important new developments, especially buildings, the Fomes annosus Location Map and the 1:10,000 scale photos should be consulted. When the root disease is indicated to be near proposed developments, an on-site inspection should be made, preferably by a plant pathologist from FIDM, to advise on the root disease situation at the exact alternative location for recreation developments. It is suggested that buildings not be located near the margins of centers containing large trees which will eventually die and may fall on these structures. On the other hand, they can be located well inside centers where the danger of being hit by trees is minimal, and which will be regenerated after construction. In much the same way, roads and asphalt pads in campgrounds and parking lots can often be located in infection centers in order to take advantage of clearings which would otherwise have to be regenerated. Construction often causes additional infections due to tree scarring and root damage, and locating developments in existing centers will decrease the damage to the surrounding stand.

Removal of infected trees. Pines infected by annosus root rot usually are killed by bark beetles or borers, but sometimes an infected pine sustains extensive root decay and windthrows while still alive, causing property damage, personal injury or death. This type of tree failure occurs more frequently in incense-cedar than pine. It is recommended that a pathologist examine all centers near developments before construction begins so that all trees expressing root disease symptoms or other hazards can be identified for management.

In addition, periodic inspections should be made after construction in order to identify additional hazardous trees. This inspection can be made by a FIDM pathologist or by a person assigned to the Forest but trained by FIDM.

Early heavy thinning of young pine stands is recommended because it limits the number of successful stump infections and subsequent root disease centers. Small stumps dry out quickly and opening the canopy allows the sun to heat them to high temperatures lethal to the fungus.

Armillaria Root Disease:
Armillaria mellea usually uses dead oaks as a food base from which to successfully attack and kill conifers in California. The extent of the damage is usually limited by the size of the oak root system.

The disease does not generally spread much beyond the influence of this root system. Whenever possible let the large oaks live. If they are competing with the conifers, and the conifers are the desired species, cut back the oaks but let them sprout.

The time to manage oaks is when they are less than 6 inches dbh. At that time they still have a small root system and will only provide a small food base for A. mellea.

If an older oak is dying, and it does not represent a hazard, do not cut it down. The other decay fungi in the oak will compete with A. mellea for the oak as a food base and reduce the potential impact of this disease.

Western Dwarf Mistletoe:
In developing stand management prescriptions for ponderosa, Jeffrey and Coulter pine stands infected with dwarf mistletoe, the following stand treatments or combinations of stand treatments may be used to control or lessen the impact of this pest on forest recreation stands. These suggested treatments are arranged by age classes of the recreation stands.

A. Even-aged (single-storied) stands above 6" dbh

1. Thin mistletoe infected stands to maintain optimum growth of the residuals and reduce stress. Select against mistletoe infected trees. Consider the removal of all trees with Hawksworth dwarf mistletoe rating of 5 and 6. Such trees will probably die within the next 10 year period, most likely during the next drought. Treat all freshly cut stumps with borax to prevent invasion by Fomes annosus.

2. Broom prune high value dwarf mistletoe infected trees, if after removal of the dwarf mistletoe brooms, the trees will have a live crown ratio of 30% or more.

3. When treating stands the creation of buffer strips should be considered at the margins of dwarf mistletoe infestations to prevent spread into or out of the treated area. These buffers should be used in the following order of priority.

   a. Natural occurring buffers (meadows, roads and changes in type).

   b. Type conversion, by removal of susceptible species.

   c. Clear cut strips.

   d. Periodic (2 year) pruning of strips of lightly to moderately infected pines.

4. Pruning of all infected branches in infected trees in an attempt to eradicate this pest is generally not recommended.

But in exceptional cases, where attempted on high value trees, this treatment should be restricted to trees with a dwarf mistletoe rating of 1 or 2 which have infections restricted to the lower 1/3 of the crown. When pruning, remove all branches in the lower ½ of the crown. Again, do not attempt if this will result in a tree with a crown of less than 30% or if the tree will be exposed to continued infection from adjacent infected trees. (Schedule 6 years of resurvey/ retreatment at 2 year intervals.)

5. Eradication of small infestations of dwarf mistletoe patches in pole or mature timber should be attempted only in areas of about 1 acre or less and should be inspected and retreated every 2 years for a 6 year period.

B. Even-aged stands under 6" dbh

1. Residual removal. Where infected overstory residuals threaten young developing stands, remove the infected residual trees and treat the young stands by thinning or pruning mistletoe out of infested understory stands. Plan for resurvey and retreatment of the young stand every 2 years for a 6 year period.

2. Stand destruction. Young stands (seedling-sapling) moderately to heavily infected should be destroyed along with infested overstory trees within and at margins of the treated stand. Regenerate, resurvey, and retreat any new appearing infections along margins of treated area.

C. All-aged or multistoried stands

1. If regeneration of the stand is desired, the following steps should be taken in order:

   a. Remove overstory.

   b. Remove all infected trees from released understory.

   c. Create a buffer strip around released stand, if needed.

   d. Run post treatment surveys every 2 years for 6 years.

2. If it is desirable to retain the overstory:

   a. Remove infected understory in competition with overstory.

   b. Broom prune highly valuable overstory trees.

   c. Replant openings in infected stands as they develop, with resistant species (oaks, cedars, firs, sugar pine).

Elytroderma Needle Disease:
Elytroderma deformans is not a major disease problem. The impact of

this disease can be reduced by stand manipulation, removing heavily infected trees with declining crowns and favoring resistant species in areas prone to infection.

Pest Problems on the Proposed Site

The following are the insect and disease problems occurring on the site of the proposed Laguna Mountain entrance information station. The numbers at the beginning of each section correspond to the numbered areas marked on the map.

There were certain constraints that reduced the viable options that could be used. The most dominant of these was that the landscape architect wanted to keep as many of the trees as possible for screening and aesthetics. If the tree would live 10 years and if it was important in the overall design, for screening or aesthetics the tree would not be removed, no matter what its dwarf mistletoe rating.

1. Two Jeffrey pine infected with western dwarf mistletoe. The trees should be broom pruned to increase their vigor and extend their longevity.

2. Two small Jeffrey pine Hawksworth dwarf mistletoe rating (DMR) of 5 and 6. These trees will be retained. The dwarf mistletoe does not represent a threat to the surrounding vegetation because the seed cannot spread that distance.

3. F. annosus centers within a stand of Jeffrey pine. Within this area the oaks should be favored. Also the area around the infection center should be regenerated with California black or live oak.

4. Two Jeffrey pine, on the edge of the F. annosus infection center one with DMR rating of 6 and the other dead. Remove these trees.

5. Two Jeffrey pine, the larger heavily infected with Elytroderma needle disease and an DMR rating of 6. The crown of the tree is starting to deteriorate. There is reduced needle retention and the needles are short and chlorotic. This tree is overtopping another Jeffrey pine with DMR of 6 and a broken top. These trees will probably not last ten years. Remove both trees.

6. Large Jeffrey pine DMR of 6. The landscape architect feels this tree is needed to visually frame the entrance to the information center as the visitor approaches the proposed foot bridge. The crown is totally infected with dwarf mistletoe. The tree will probably last 10 years if there is no drought, but not much longer.

7. Jeffrey pine DMR of 6. Should be removed. 8 & 9 same as 6.

10. Four Jeffrey pine average dbh 7", DMR of 6. These trees will not live ten years. Remove them.

11-12-13. Three Jeffrey light to moderately infected with dwarf mistletoe. The trees have good live crown ratios and healthy crowns. These trees need to be retained and additional trees planted. The three Jeffrey pine should be broom pruned. This will reduce the impact of the dwarf mistletoe and increase the longevity of the trees. However, this will also leave some dwarf mistletoe in the crowns which would be a potential source of inoculum if these trees were underplanted with Jeffrey, ponderosa or coulter pine. Therefore, resistant species such as sugar pine, incense-cedar and/or California black or live oak should be used to regenerate this area.

14-15. Two Jeffrey pine average dbh 10", DMR of 6. Not needed for aesthetics or screening. Remove these trees.

16. Two large Jeffrey pine, DMR of 3, plus two small Jeffrey pine, understory trees infected with dwarf mistletoe. These are the only infected trees in an otherwise clean stand. The trees should be removed to keep the disease from spreading to the rest of the stand.

17. Jeffrey pine lightly infected with dwarf mistletoe. Broom prune or remove just about all the mistletoe from the tree which will still leave the tree with a vigorous crown and a good live crown ratio.

18. Jeffrey pine 10" dbh, DMR of 5. The crown is starting to decline. Remove the tree.

19-22. These are large Jeffrey pine 19-30" dbh, that would help screen the proposed parking lot from the Sunrise Highway. Nineteen and 20 have DMR of 6. They are old character trees, that will most likely live another 10 years. They should be retained without treatment. Twenty-one and 22 have DMR of 5 and 4, respectively. These trees could be broom pruned, to reduce the impact of dwarf mistletoe.

23. An old Jeffrey pine character tree that woodpeckers use for storage. DMR of 3. Underneath this tree are four Jeffrey pines approximately 5" dbh infected with dwarf mistletoe. The character tree could be broom pruned. The four small trees should be removed because they will not become desired leave trees in a future stand.

24. Seven Jeffrey pines, 4-16" dbh infected with dwarf mistletoe within a clean stand. It would be desirable to remove all these trees so that the disease would not spread to the rest of the stand.

25. Large Jeffrey pine, DMR of 1. Broom pruning would probably eliminate any dwarf mistletoe from the tree.

26. Large Jeffrey pine with a DMR of 6. Underneath this tree are 5 understory Jeffrey pines, infected with dwarf mistletoe. These trees should be removed to prevent the disease from spreading into the rest of the stand.

27. This is a large F. annosus infection center. The majority of the trees in the center have been killed and the disease is starting to kill some of the smaller poles near the edge. To stop the spread of the disease, an oak barrier should be regenerated between the healthy pine stand and the infection center. If the infection center is going to be regenerated, hardwoods resistant to infection by F. annosus such as California black and live oaks should be favored.

27a. These two Jeffrey pines are on the leading edge of the F. annosus infection center. They are going to be removed as part of the road right-of-way. If possible, when they are harvested, high stumps should be left. This will allow the tractor working in the area to remove the stump, breaking continuous root contact between the infection center and the healthy stand.

28. This is an area in which all the Jeffrey pine are heavily infected with dwarf mistletoe. All the trees have DMR of 5 or 6. The trees are needed to visually frame a sweeping curve in the road and for aesthetics. Therefore, no control measures will be applied.

29. A single dwarf mistletoe infected Jeffrey pine in a stand otherwise free of dwarf mistletoe but heavily infected with Elytroderma deformans. The dwarf mistletoe infected tree should be removed to keep disease from spreading to the rest of the stand. Although the crowns of these trees are heavily infected with Elytroderma needle disease, the crowns are vigorous and the disease does not appear to be having much impact on the health of the stand.

30. These lines mark the leading edge of two F. annosus infection centers. As the infected trees within these centers start to decline, California flatheaded borer is attacking and killing them. This insect is not spreading to any of the uninfected trees. As with the other F. annosus infection centers, a hardwood barrier should be established to stop the spread of the disease.

There are a number of stands circled on the map that have no number. These stands are infected with Elytroderma needle disease. The disease does not seem to be having much of an impact on the vigorously growing trees. However, the disease will contribute to the decline of slower growing trees. When opportunities arise to manipulate the stand, uninfected or lightly infected trees should be favored over moderately or heavily infected trees.

OTHER CONSIDERATIONS OR REQUIREMENTS

1. Whenever a tree is felled, the stump must be treated with borax to prevent infection by F. annosus.

2. Wherever a dwarf mistletoe eradication treatment has been applied, the area must be reevaluated every 2 years for 6 years to determine if the objectives of the treatment have been achieved. If additional work is required it must be done the year of the evaluation.

3. Slash generated during stand management operations could encourage pine engraver beetles (Ips spp.). Pine engravers are the principle pest associated with residues in pine regions. Tree killing frequently occurs where green pine slash is used as breeding habitats during spring and summer. One approach to minimizing damage is to schedule slash-generating activities mostly in the late summer, fall and early winter when the beetles are not flying or the slash has a high probability of drying out before the beetles can complete their development. Green pine slash created during the spring and summer should be treated to prevent the buildup of pine engraver populations. Because pine engravers can complete their development in about a month under ideal conditions, treatment should be carried out soon after cutting to be effective. Some methods of slash treatment that might be acceptable in dispersed recreation areas would include lopping and scattering slash in sunny areas to speed its drying out, crushing or mashing with logging equipment to make it unsuitable for pine engraver breeding or piling and burning the slash within a month of cutting. Broadcast burning the slash might work if it could be done while the slash was green and without damaging the residual stand. Encourage wood cutter collection of material over 3" diameter and removal from the forest within 4 to 5 weeks of cutting (the sooner the better). Do not pile slash but leave scattered until removed. Under no circumstance should the wood or slash be stacked against live trees. Another method which might work is to pile slash in a sunny area and tightly cover the pile with clear plastic. If the temperature under the bark of the slash in all parts of the pile reaches 120°F, all brood currently in the pile will be killed. Lower temperatures will not be effective and where successful, this method will not prevent reinfestation of slash piles. The most acceptable methods of slash treatment in high use recreation areas would probably be disposal by chipping or removal from the site.

SELECTED REFERENCES

1. Furniss, R.L. and V.M. Carolin
1977. Western Forest Insects. Misc. Publication No. 1339
USDA Forest Service.

2. Scharpf, R.F. and Smith, R.S.
1978. Diseases of Pacific Coast Conifers. Chapters 5 and 6.
Agriculture Handbook NO. 521
USDA Forest Service

3. Wood, R.E. et. al.
1979. An Evaluation of Tree Mortality in Laguna Mountain Recreation Area Cleveland National Forest. USDA Forest Service, Forest Insect and Disease Management, Region 5.
Rpt. No. 79-1.